	Course Information (2019-2020)	
1	Unit name:	Digital Control System I
2	Code:	EcE -51003
3	Classification:	Engineering subject
4	Credit value:	3 (2-0-2)
5	Semester/ Year Offered:	1/5
6	Pre-requisite:	Digital Electronics, Technical Programming, Modeling and control, Modern Control System
7	Mode of delivery:	Lecture, Practical, tutorial
8	Assessment system and breakdown of marks: **Practical and lab report, tutorial, Examination**	
	Practical	20%
	Tutorial	10%
	Mid-term/ final Examination	70%
9	Academic staff teaching unit:	Department of Electronic Engineering
10	Course outcome of unit: In this course students will be able ➢ To design and analyze the stability and transient response of a system by using root locus method ➢ **To apply MATLAB in solving problems in digital control system** ➢ To explain the specifications of the PIC xx microcontroller	
11	Synopsis of unit: The course covers the techniques of analysis of linear control system and control design. The course introduces students to apply the root locus in the s-plane can be determined by a graphical method, the roots of the characteristics equation move around the s-plane by changing one parameter. In addition course introduces students to familiar terms and specifications of the PIC microcontrollers, PIC16 series, the 16F84A, parallel ports, power supply, the clock oscillator, assembler programming language by using MPLAB IDE software will be learned.	

Topic:

Chapter Title

13. Digital Control System

13.1 Introduction

13.2 Digital Computer Control System Application

13.3 Sampled-Data System

13.4 The Z-Transform

13.5 Closed loop feedback sampled data systems

13.6 Performance of a sampled data, second order system

13.7 Closed-Loop Systems with Digital Computer Compensation

13.8 The root-locus of digital control systems

1. The PIC Microcontroller Family

1.1 12-bit Instruction Word

1.2 14-bit Instruction Word

1.3 16-bit Instruction Word

1.4 Inside a PIC Microcontroller

2. Introducing the PIC® 16 Series and the 16F84A

2.1 The Main Idea—The Pic 16 Series Family

2.2 An Architecture Overview Of The 16f84a

2.3 A Review Of Memory Technologies

2.4 The 16f84a Memory

2.5 Some Issues Of Timing

2.6 Power-Up And Reset

2.7 What Others Do—The Atmel At89c2051

2.8 Taking Things Further—The 16f84a On-Chip Reset Circuit

3. Parallel Ports, Power Supply and the Clock Oscillator

3.1 The Main Idea—Parallel Input/output

3.2 The Technical Challenge Of Parallel Input/output

3.3 Connecting To The Parallel Port

3.4 The PIC 16F84A Parallel Ports

3.5 The Clock Oscillator

3.6 Power Supply

3.7 The Hardware Design Of The Electronic Ping-Pong

	4. Starting to Program An Introduction to Assembler 4.1 The Main Idea—What Programs Do and How We Develop Them 4.2 The PIC 16 Series Instruction Set, with a Little More on the ALU 4.3 Assemblers and Assembler Format 4.4 Creating Simple Programs 4.5 Adopting a Development Environment 4.6 An Introductory MPLAB Tutorial 4.7 An Introduction to Simulation 4.8 Downloading the Program to a Microcontroller 4.9 What Others Do A Brief Comparison of CISC, RISC Instruction Sets 4.10 Taking Things Further The 16 Series Instruction Set Format
14	Main references: Modern Control Systems(11th Edition)by Richard C.Dorf and Robert H.Bishop PIC microcontrollers: know it all / Lucio Di Jasio … [et al.].p. cm. – (The Newnes know it all series) ISBN-13: 978-0-7506-8615-0. www.books.elsevier.com
15	Additional references: Note by Modern Control Systems, 11st Edition, Richard C. Dorf, Robert H. Bishop, Prentice-Hall, Upper Saddle…., (http://www.Mypearsonstore.com>bookstore) PIC16F84 to PIC16F84A Migrati on (2001). Microchip Technology Inc.DS30072A and B; www.microchip.com Atmel 8051 Microcontrollers Hardware Manual (2004). Atmel Corporation, Ref. 4316C-8051-05/04; http://www.atmel.com/ Design Tips and Troubleshooting of the PICmicroTM Microcontroller Oscillator (2001). Kingbright Elec. Co. Ltd. Taiwan; http://www.kingbright.com.tw

Information on Lab Practical

Lab	Activity
1	**Experiment 1: Step response for a first order unity feedback system by using MATLAB** **Objectives**: • To apply step response of 1st order system • To apply Matlab/Simulink Software **Equipment required:** • Matlab software, Personal computer
2	**Experiment 2**: **Continuous-time system to discrete-time system by using MATLAB** **Objectives**: • To convert continuous-time system to discrete-time system with c2d function • To apply Matlab/Simulink Software **Equipment required:** • Matlab software, Personal computer
3	**Experiment 3: Discrete-time system to continuous-time system by using MATLAB** **Objectives:** • To convert continuous-time system to discrete-time system with d2c function • To apply Matlab/Simulink Software **Equipment required:** • Matlab software, Personal computer

4	**Experiment 4**: **The response of the system by using MATLAB** **Objectives**: • To determine the discrete response, y(kT) of close-loop system using step ,impulse and arbitrary input. • To determine the continuous response y(t) using a unit step for the system. • To apply Matlab/Simulink Software **Equipment required:** • Matlab software, Personal computer
5	**Experiment 5: Root locus of digital control system by using MATLAB** **Objectives**: • To plot the root locus of digital control system • To determine K for stability • To apply Matlab/Simulink Software **Equipment required:** • Matlab software, Personal computer

Approved by

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